

CLAIMS

What is claimed is:

1. A modular fuel reformer comprising:
 - a fuel reformer assembly comprising a cavity;
 - 5 a removable carrier comprising at least one fuel reformer module, the carrier connecting to the fuel reformer assembly to enclose the at least one module within the cavity; and
 - a connector engageable to secure the carrier and the fuel reformer assembly in fluid-tight relationship and easily disengageable to permit removal
 - 10 of the carrier from the fuel reformer assembly.
2. The modular fuel reformer of claim 1, wherein the at least one module comprises a catalyst.
3. The modular fuel reformer of claim 2, wherein the catalyst comprises at least one of a fuel reforming catalyst, a water gas shift catalyst, a catalyst for
- 15 removing carbon monoxide or other contaminants, and a catalytic burner catalyst.
4. The modular fuel reformer of claim 1, wherein the removable carrier comprises a portion extending outside the cavity to facilitate removal of the carrier from the fuel reformer assembly.
- 20 5. The modular fuel reformer of claim 1, wherein the carrier and the cavity are generally cylindrically shaped, and the carrier fits concentrically within the cavity.

6. The modular fuel reformer of claim 1, wherein the carrier comprises a flange that contacts a surface of the fuel reformer assembly to connect the carrier to the fuel reformer assembly.
7. The modular assembly of claim 6, further comprising a gasket positioned
5 between the flange and a surface of the fuel reformer assembly.
8. The modular assembly of claim 1, wherein the connector comprises at least one of a flange with bolt holes, a clamp, a latch, a retaining spring, a threaded connection, a nut and stud, a pin, a bayonet-type engagement, a retaining ring, a chuck or collet, and a crimped disposable connector.
- 10 9. The modular assembly of claim 2, wherein the interior of the fuel reformer cavity comprises a catalyst.
10. The modular assembly of claim 9, wherein the module catalyst is adapted to facilitate a low temperature water gas shift reaction, and the catalyst on the interior of the fuel reformer cavity is adapted to perform a preferential oxidation
15 reaction.
11. A method for improving the serviceability of a fuel reformer, wherein the reformer contains one or more functional modules requiring service, the method comprising the steps of:
 - placing at least one module in a carrier; and
 - 20 providing one or more connecting means for connecting the carrier to the remainder of the reformer, wherein the connecting means are selected to allow the connection between the carrier and the reformer to be made and broken in a reversible manner.

12. The method of claim 11 wherein a module comprises a catalyst.
13. The method of claim 12 wherein a catalyst is in pelletized form.
14. The method of claim 12 wherein the catalyst is supported on a monolithic substrate.
- 5 15. The method of claim 11 wherein the carrier is a removable piece that has at least a portion of the connection means at one end of the carrier.
16. The method of claim 11 wherein the carrier is concentric with the reformer.
17. The method of claim 11 wherein the carrier is concentric with at least one section of a reformer having more than one section.
- 10 18. The method of claim 11 wherein the carrier comprises one or more modules having functions selected from non-catalytic combustion, steam generation, heat exchange, impurity absorption, mixing, fluid distribution, and insulation.
- 15 19. The method of claim 11 wherein the connecting means between the carrier and the remainder of the reformer comprises at least one of a flange with bolt holes, a clamp, a set of latches, a set of retaining springs, a threaded connection, nuts and a set of studs, pins, bayonet-type engagements, retaining rings, a chuck or collet, a disposable piece providing a crimped connector that can be uncrimped or cut to allow removal of the carrier; and combinations of these.
- 20 20. The method of claim 11 wherein the modules are secured to the carrier by a reversible means.

21. The method of claim 11 wherein the catalyst modules are secured to the carrier by an irreversible means.
22. The method of claim 11 wherein the carrier is a catalyst module.
23. The method of claim 11 wherein the carrier consists of two halves and at least
5 one module is placed in the perimeter of the first half, and then the second half is joined to the first half, compressing the module so as to retain it in place.
24. The method of claim 11 where a module contains a catalyst selected from a reforming catalyst, a water gas shift catalyst, a carbon monoxide removal catalyst, a catalytic burner catalyst, and a contaminant removal catalyst.
- 10 25. A fuel reformer, the reformer characterized in having at least one functional module mounted in a carrier, wherein the carrier is arranged so that it can be removed from the reformer by the disconnection of reversible connection means.
26. The reformer of claim 25 in which the connection means between the carrier and the reformer comprises at least one of a flange with bolt holes, a clamp, a set of
15 latches, a set of retaining springs, a threaded connection, nuts and a set of studs, pins, bayonet-type engagements, retaining rings, a chuck or collet, a disposable piece providing a crimped connector that can be uncrimped or cut to allow removal of the carrier; and combinations of these.
27. The reformer of claim 25 wherein a module contains a catalyst selected from a
20 reforming catalyst, a water gas shift catalyst, a carbon monoxide removal catalyst, a catalytic burner catalyst, and a contaminant removal catalyst.

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28. The reformer of claim 25 wherein a module has a function selected from non-catalytic combustion, steam generation, heat exchange, impurity absorption, mixing, fluid distribution, and insulation.
 29. The reformer of claim 27 wherein the catalyst is supported on a monolithic substrate or is in pelletized form.
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